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# SCIENCE.

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## COMMENT AND CRITICISM.

TO MANY PEOPLE in this practical era, the manifest usefulness of work done affords the only available standard of judging every thing. It is worth the while to see how the coast survey abides this test; for it can point to its system of charts covering every harbor of prominence in the country, and nearly all the shore-line between them, all the principal rivers to the head of tidal influence, and Lake Champlain; to its researches and publications relating to terrestrial magnetism, and its magnetic charts; to the tide-tables, published annually, of the ports on the Atlantic, Gulf, and Pacific coasts; to the 'Coast pilots' for the Atlantic and Pacific coasts and Alaska; to its explorations and discoveries in physical hydrography; to its transit-of-Venus and eclipse expeditions, and longitude determinations in Alaska and in foreign countries; to its work on the Isthmus of Panama; to the numerous scientific publications on all subjects relating to or connected with its work; to the determinations of the force of gravity in all parts of the world; to very considerable improvements in geodetic and field-astronomical instruments; and to the present perfected system of weights and measures, which has secured harmony not only within the United States by supplying standard weights and measures to every state, to the principal custom-houses, and to the agricultural colleges in the several states, but also between our own country and foreign nations.

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Such an amount of scientific and practical work of the highest merit could not possibly have been accomplished except under the wisest organization and the most efficient supervision. The character of this work is itself the sufficient argument for the maintenance of that organization. With so exceptional a record of work actually accomplished, embracing so much that is of immediate

economic bearing upon the welfare of the country and the conservation of national interests, the survey need have little fear of hostile criticism, and, least of all, that having its origin in personal or political motive. The obviously useful character of a large part of this work shows that it is of real and direct value to the nation, apart from its purely scientific merit.

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THERE IS NO PORTION of North America where complete and long-continued series of tidal observations are more important, and will yield more interesting results, than the coast of Canada. The great rise and fall in some portions, and the anomalous conditions and irregular and unequal tidal currents prevailing along its deeply indented shores, render a careful study of them a matter of serious interest from both a scientific and practical point of view. We are glad to see that the matter has been attracting attention among our neighbors, and that the different commercial bodies of Canada have moved in the matter. A report on the subject by a committee of the British association, at the Aberdeen meeting, shows what has been done, and what is proposed. The matter is one more of general than local importance. As such, it appears to be well worthy the attention of the imperial government, which, at small cost to itself, can here properly come to the aid of the colonial department of marine, in the interest of the commerce and navigation of the world. Tidal observations on the eastern coast of America have gained a new importance since the coast and geodetic survey has confirmed by recent observations its announcement, some years since, that there are tidal fluxes in the Gulf Stream, and variations of its velocity due to half-monthly changes in the relative sea-levels of the Atlantic and Gulf of Mexico.

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JUDGED BY THE RESULT, it would seem that the civil engineers' convention, recently held at Cleveland, to consider the relations of civil and military engineers, found, that, like an historical gathering at Ephesus, it had come together with-

out sufficient reason. Congress is asked by the convention to 'organize a civil bureau of public works' in a certain way, and for certain reasons. It is difficult for an onlooker to interpret the way and reasons, otherwise than that the army engineers are in possession of a good thing which some of their civil brethren covet: hence the intervention of congress is invoked to change the established order, to put the one class out and the other in, or, if this may not be, that the good thing be at least divided. The reasons given are weak, and open to dispute, some easily refuted; and the request that the basis of organization of the proposed bureau should be studied and reported on by a board consisting of seven members — three military engineers, three civil engineers, and a lawyer — savors quite strongly of place-making for some of the leaders in the movement. All this is unfortunate. There are strong and good reasons why the organization for the conduct of public works should be recast, just as necessity for re-organization has been found in other departments of administration. That these reasons exist is proven by the fact that a letter from the chief of engineers, U. S. army, General Newton, was read at the meeting, expressing sympathy with any move which would better the public service. The betterment of the public service ought to have impressed itself upon the Cleveland meeting as being the only ground upon which they could go before the country with reasonable expectation of being listened to. Instead of this, the convention considered the question as one of class, and seeks to secure class legislation in a way which is itself a suggestion that congress is incapable of doing its own work.

#### *THE COAST AND GEODETIC SURVEY.*

THE time was long ago when any one would think of asking what is the use of having any coast survey at all, — one might almost say, long past, when any one would expect that the work of such an organization could ever be brought to an end. As originally constituted, by the act of 1843, the organization was empowered to proceed with the accurate mapping of the Atlantic and Pacific coasts of the United States, — a work which involved a trigonometric survey of the coast-lands to be conducted with the utmost precision. This formed also the only suitable basis for the hydrography of the coasts.

Those interested in the thorough prosecution of this work were not slow to appreciate the obvious

advantages of connecting the independent surveys of these coasts into a single homogeneous system. The surveys of individual states might thus be supplied with the precise determination of points for their own topographic and geologic work, and the entire domain of the United States be covered by a net-work of triangles of the utmost accuracy. The foundations of this vast work were laid nearly fifteen years ago; and in its execution natural precedence has been given to those regions where there was the most urgent call for the work. Such a connecting-link is a necessary part of a survey of the 'coasts and adjacent islands, etc., of the United States,' as originally provided for by law, in order to bring into harmony the measurements along the Atlantic and Pacific coasts. As Professor Hilgard has pointed out, this is sufficiently obvious to allow the belief that it would have been specified in the original law, if, at the time of its enactment (1807), the country had had a 'western coast.'

But this is not all: what is the obvious requirement of the law has led, in addition, not only to the incidental accomplishment of important scientific results, but also to many advantages of the most practical significance. To appreciate the former, we need only recall that our national domain extends in an east and west line over about one-eighth of the circumference of the entire earth, and that the accurate measurement of this line, as undertaken by the survey, will constitute much the longest arc-parallel ever measured for determining the size and figure of the earth. The same survey will afford accurate elevations of a multitude of points above a common datum plane, and will show the relation of the mean level of the Atlantic and Pacific oceans. From a purely scientific stand-point, these would be reasons enough for completing the transcontinental survey as originally outlined; but let us see what some of the practical advantages of the work are. To begin with, this already well-advanced scheme of a national survey, from ocean to ocean, provides every subsidiary state survey with an accurate base-line. How important this is will appear if one attempts to conjoin the hitherto existing surveys of adjacent states. Discrepancies of many miles are frequent; for example, "The best maps of the states of Ohio, Indiana, and Kentucky, constructed upon independent data, when put together, leave no delineation of the Ohio River. Between the land-survey maps of Illinois and Missouri, the Mississippi River presents in places wide lakes, while in others it entirely disappears." The transcontinental link also adjusts the lines and points of the public land surveys, and furnishes the necessary data